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Auch mit seiner neuen Reihe „IAB-Discussion Paper“ will das Forschungsinstitut der Bundesagentur für Arbeit den Dialog mit der externen Wissenschaft intensivieren. Durch die rasche Verbreitung von Forschungsergebnissen über das Internet soll noch vor Drucklegung Kritik angeregt und Qualität gesichert werden.

Also with its new series "IAB Discussion Paper" the research institute of the German Federal Employment Agency wants to intensify dialogue with external science. By the rapid spreading of research results via Internet still before printing criticism shall be stimulated a quality shall be ensured.

Abstract

The gender wage gap in Germany is smaller in firms covered by collective contracts or having a works council, partly because these institutions are associated with lower unobserved productivity differences and less wage discrimination, partly because they compress the distribution of wage residuals.

Keywords: Gender Wage Gap, Works councils, Collective Bargaining, Juhn-Murphy-Pierce-Decomposition

JEL-classification: J51, J71

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The gender wage gap and industrial relations

In a number of cross-country studies Blau and Kahn (1996, 2000, 2003) find support for the idea that egalitarian wage structures – enforced by minimum wage laws and collective bargaining conventions – reduce the gender wage gap. These institutions raise women's relative wages, primarily since women tend to be at the bottom of the wage distribution in all countries. However, cross-country studies cannot control for all variables that shape country-specific wage distributions. Thus a comparison of different industrial relations regimes *within* a given country can clarify further whether certain institutions have a major impact on the size of the gender wage gap.

In this vein our paper compares gender wage gaps across German industrial relations regimes. An extension of the decomposition suggested by Juhn et al. (1993) allows us to identify the relative importance of gender-specific factors and wage structures and to disentangle unobserved individual and firm effects.

The literature offers several arguments why unions compress the distribution of wages (Freeman and Medoff, 1984): Wage compression strengthens solidarity, reduces opportunities for discrimination, insures risk adverse workers and might be in the interest of the median union member. However, in Germany firms do not differentiate wages between workers with and without union membership - it is the application of collective contracts at the firm level that has an impact on wages. Furthermore, not only collective wage contracts, but also works council affect wage distributions within firms (Hübler and Jirjahn 2003). Though works councils' codetermination rights do not formally include negotiating over wages, they negotiate about the placing of workers in higher wage groups.

Therefore in our empirical analysis we distinguish between four industrial relations regimes: First between firms that apply or not apply collective wage contracts at the industrial or firm level, second between establishments with and without a works council.

Method

The applied method extends the approach suggested by Juhn et al. (1993) by including fixed firm effects on wages. Let the wage equation for an individual man i working in an establishment under industrial relations regime $j \in$ (with, without) be

$$(1) \quad w_{ij}^{M} = X_{ij}^{M}\beta_j^{M} + u_{ij}^{M} + e_{ij}^{M} = X_{ij}^{M}\beta_j^{M} + \tau_j^{M}\alpha_{ij}^{M} + \sigma_j^{M}\theta_{ij}^{M},$$

where w_{ij} is the log daily wage, X_{ij} is a column vector of observed human capital variables, β_j are rates of return to human capital, u_{ij} is a fixed firm effect on wages and e_{ij} is a wage residual; M denotes male workers. We define $u_{ij} = \tau_j\alpha_{ij}$ and $e_{ij} = \sigma_j\theta_{ij}$, where τ_j is the standard deviation of fixed firm effects on wages, α_{ij} is a standardized fixed firm effect, σ_j is the standard deviation of wage residuals and θ_{ij} is a standardized residual. Estimated coefficients for β_j^{M} and α_{ij}^{M} are used to predict a standardized error term θ_{ij}^{F} for female workers; F denotes female workers. Then the *gender wage gap within regime j* can be computed as

$$(2) \quad \begin{aligned} D_j &= \overline{w}_j^{M} - \overline{w}_j^{F} = (\overline{X}_j^{M} - \overline{X}_j^{F})\beta_j + \tau_j(\overline{\alpha}_j^{M} - \overline{\alpha}_j^{F}) + \sigma_j(\overline{\theta}_j^{M} - \overline{\theta}_j^{F}) \\ &= \Delta\overline{X}_j\beta_j + \tau_j\Delta\overline{\alpha}_j + \sigma_j\Delta\overline{\theta}_j \end{aligned}$$

Drawing on (2), the *difference in wage gaps across two regimes* can be decomposed into

$$(3) \quad \begin{aligned} D_{with} - D_{without} = {} & \underbrace{(\Delta\overline{X}_{with} - \Delta\overline{X}_{without})\beta_{with}}_{1.} + \underbrace{\Delta\overline{X}_{without}(\beta_{with} - \beta_{without})}_{2.} \\ & + \underbrace{(\Delta\overline{\alpha}_{with} - \Delta\overline{\alpha}_{without})\tau_{with}}_{3.} + \underbrace{\Delta\overline{\alpha}_{without}(\tau_{with} - \tau_{without})}_{4.} \\ & + \underbrace{(\Delta\overline{\theta}_{with} - \Delta\overline{\theta}_{without})\sigma_{with}}_{5.} + \underbrace{\Delta\overline{\theta}_{without}(\sigma_{with} - \sigma_{without})}_{6.}. \end{aligned}$$

The right-hand side components can be characterized as follows: 1.) The *observed X-effect* displays the contribution of differences in observed gender-specific endowment across regimes. 2.) The *observed price effect* results from differences in returns to human capital across regimes. 3.) The *between firm gap effect* follows from different positions of female workers in the male distribution of firm effects and shows whether gender-specific sorting between high and low wage firms is different across regimes. 4.)

The *between firm unobserved price effect* reflects differences in the variance of fixed firm effects across regimes. 5.) The *within firm gap effect* results from different positions of female workers in the male residual distribution and reflects differences in unobserved characteristics or in wage discrimination across regimes. 6.) The *within firm unobserved price effect* denotes the contribution of differences in the variance of residuals across regimes. Terms 3 to 6 are estimated empirically as described in Blau and Kahn (1996, S42), using the entire distributions of residuals and firm effects.

Data and empirical results

We use a German employer-employee data set for the year 2001 that merges establishment survey data (the IAB-establishment panel) and process generated individual data (the Employment Statistical Register of the IAB, which is based on administrative social security records). Wages are reported up to the social security contribution limit; in order to avoid biased estimation we impute censored wages with estimated wages (for details see Gartner 2004). The analysis is restricted to full time German workers in West Germany, working in establishments with at least 10 male workers. The dependent variable is the log daily wage; covariates are potential experience (cubic) and educational dummies. Table A1, A2 and A3 in the Appendix present our descriptive statistics, the results of the regression analysis and the composition of the sample. Note that the data do not allow controlling for self-selection of women in the labor market, that we do not control for detailed work biographies and that the method is not invariant to the index chosen (Blau and Kahn, 1996, S43). The importance of an interaction between collective contracts and works councils for the size of the gender wage gap will be explored in a follow-up paper.

Table 1 presents our core results. In addition to comparing all firms not covered respectively covered by collective contracts and without respectively with a works council we replicate estimations for firms with less than 250 employees, since larger firms - apart from rare exceptions - generally have works councils (Addison et al., 2001).

Table 1: Analysis of the difference in the log-wage gender wage differential

	All firms				Small firms (10-250)			
	Collective contract		Works council		Collective contract		Works council	
Descriptive statistics	**Without**	**With**	**Without**	**With**	**Without**	**With**	**Without**	**With**
Mean log wage male workers	4.61	4.69	4.45	4.70	4.53	4.57	4.45	4.59
Mean log wage female workers	4.34	4.49	4.22	4.49	4.26	4.37	4.19	4.39
Gender wage gap	0.26	0.20	0.23	0.21	0.27	0.20	0.26	0.21
Mean female percentile	32	33	35	32	32	34	33	33
Number of observations								
Number of men	71,602	834,363	47,796	817,365	35,077	132,054	34,558	125,247
Number of women	32,450	294,703	19,317	298,183	16,529	61,249	14,387	60,128
Number of firms	1,006	3,612	1,155	3,288	896	2,458	1,111	2,110

	All firms		Small firms (10-250)	
Decomposition	**Collective contract**	**Works council**	**Collective contract**	**Works council**
Difference in gender wage gaps	-0.06	-0.02	-0.07	-0.06
1. observed X	-0.02	0.01	-0.01	0.01
2. observed price	0.00	0.00	0.00	0.01
3. between firm gap	0.01	0.02	-0.01	0.00
4. between firm unobs. prices	0.00	0.01	-0.01	-0.01
5. within firm gap	-0.03	-0.04	-0.02	-0.04
6. within firm unobs. prices	-0.03	-0.03	-0.03	-0.02
Sum gender specific (1+3+5)	-0.04	-0.01	-0.04	-0.03
Sum wage structure (2+4+6)	-0.03	-0.01	-0.03	-0.02

Notes: Wage in logs of daily wage. Estimation includes controls for education and experience.
For computing the mean female percentile we assign each women the percentile within the male wage distribution.

The descriptive statistics in the upper panel show, that average wages are generally higher within firms applying collective contracts and having works councils. This is partly a firm size effect – the difference is less pronounced in the sample of small firms. The gender wage gap is 6 percentage points smaller across workers employed in establishments covered by collective contracts (0.20 resp. 0.26). It is 2 percentage points smaller in firms having a works council (0.21 resp. 0.23), but 6 percentage points in the sample of small firms. The mean position of women in the male wage distribution lies around the 33rd percentile for all industrial relations regimes.

The decomposition of the difference in gender wage gaps across regimes is displayed in the lower panel. Differences in explained characteristics, in rates of return, in the distribution of women across high and low wage firms as well as in the dispersion of firm wage effects do not have a large impact on differences in the gender wage gap. The most important components of the decomposition are the *within firm gap* (5.) and the *within firm unobserved price component* (6.), which relate both to the size and distribution of residuals. The high value of the *within firm gap* implies: Institutions as collective contracts and works councils are associated with lower unobserved productivity differentials or less wage discrimination within firms. Works councils seem to be even more successful than collective contracts in fulfilling this task. The remarkable size of the *within firm unobserved price components* shows that a lower gender wage gap is also associated with a more compressed wage distribution within firms applying collective contracts and having works councils.

Conclusions

Our analysis supports the cross-country result of Blau and Kahn (1996, 2000, 2003) that a unionized wage-setting reduces the gender wage gap. We compare different industrial relations regimes within a country and show that the gender wage gap is smaller for workers employed in firms covered by collective contracts, but also in firms having works councils. One reason is that the distribution of wage residuals is more compressed within these firms; this is advantageous for female workers, which are more frequently at the bottom of the wage distribution. Furthermore, the-

se institutions seem to reduce unobserved productivity differentials or wage discrimination or both.

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Appendix

Table A1: Mean Values of Explanatory Variables

	All firms				Small firms (10-250)			
	Collective contract		Works council		Collective contract		Works council	
	Without	With	Without	With	Without	With	Without	With
Male								
Low education	0.11	0.12	0.15	0.12	0.11	0.12	0.15	0.11
Vocational training	0.62	0.69	0.68	0.68	0.66	0.72	0.70	0.71
Second. school (Abitur)	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Abitur + Voc. Training	0.05	0.05	0.04	0.05	0.05	0.05	0.04	0.05
College (FH)	0.07	0.06	0.04	0.06	0.06	0.05	0.04	0.05
University	0.14	0.08	0.08	0.08	0.11	0.06	0.07	0.07
Experience	20.15	22.48	20.25	22.46	20.73	22.70	20.64	22.71
Experience²/100	4.99	5.97	5.06	5.96	5.22	6.09	5.22	6.08
Experience³/1000	14.04	17.57	14.32	17.55	14.82	18.06	14.91	18.02
Female								
Low education	0.16	0.15	0.18	0.15	0.15	0.14	0.17	0.13
Vocational training	0.64	0.65	0.66	0.65	0.66	0.71	0.67	0.70
Second. school (Abitur)	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Abitur + Voc. Training	0.08	0.10	0.07	0.10	0.07	0.08	0.08	0.08
College (FH)	0.03	0.03	0.02	0.03	0.03	0.03	0.02	0.03
University	0.08	0.06	0.06	0.06	0.07	0.05	0.05	0.05
Experience	18.85	20.25	18.93	20.15	19.45	20.69	19.09	20.72
Experience²/100	4.62	5.24	4.70	5.23	4.86	5.43	4.76	5.43
Experience³/1000	13.08	15.41	13.44	15.30	13.92	16.07	13.66	16.04

Table A2: Wage regressions with fixed firm effects for male workers - Coefficients

	All firms				Small firms (10-250)			
	Collective contract		Works council		Collective contract		Works council	
	Without	With	Without	With	Without	With	Without	With
Education[1]								
Vocational training	0.218	0.167	0.217	0.169	0.219	0.220	0.229	0.218
Second. school (Abitur)	0.178	0.173	0.240	0.168	0.221	0.235	0.217	0.233
Abitur + Voc. Training	0.398	0.344	0.400	0.347	0.402	0.379	0.406	0.381
College (FH)	0.550	0.535	0.517	0.534	0.516	0.551	0.513	0.547
University	0.670	0.643	0.630	0.646	0.634	0.676	0.626	0.670
Experience	0.056	0.047	0.051	0.049	0.051	0.051	0.052	0.052
Experience²/100	-0.169	-0.139	-0.166	-0.145	-0.151	-0.150	-0.164	-0.148
Experience³/1000	0.018	0.014	0.018	0.015	0.015	0.015	0.018	0.015
Constant	3.797	3.996	3.760	3.982	3.762	3.802	3.731	3.806
Estimated τ	0.241	0.165	0.232	0.157	0.244	0.165	0.231	0.158
Estimated σ	0.244	0.212	0.241	0.213	0.249	0.221	0.242	0.223
Overall R^2	0.402	0.376	0.368	0.381	0.372	0.357	0.337	0.362

Notes: Dependent variable log(daily wage). All coefficients are significant at α= 0.001.

1) Reference category: low education

Table A3: Number of observations

	All firms				Small firms			
	Collective contract				Collective contract			
Works council	Without	With	Unknown	Total	Without	With	Unknown	Total
Worker								
Without	36,188	30,845	80	67,113	26,064	22,801	80	48,945
With	62,292	1,050,241	3015	1,115,548	22,401	162,446	528	185,375
Unknown	5,572	47,980	159	53,711	3,141	8,056	159	11,356
Total	104,052	1,129,066	3254	1,236,372	51,606	193,303	767	245,676
Firms								
Without	574	580	1	1,155	552	558	1	1,111
With	384	2,891	13	3,288	300	1,802	8	2,110
Unknown	48	141	3	192	44	98	3	145
Total	1,006	3,612	17	4,635	896	2,458	12	3,366

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